## Some Applications of the Kinetic Tandem Concept\*

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The Kinetic Tandem (K. T.) open-ended fusion power plant concept [1,2] employs ion or fast-neutral beams, injected into a converging solenoidal magnetic field, to create a localized region of high ion density in the vicinity of the reflection points of the injected ions. These high density regions can form the "plugs" of a tandem mirror in a manner similar to the method employed in the original tandem mirror concept [3,4]. advantage of the K. T. over these earlier tandem-mirror concepts is that the confining magnetic field is axially symmetric, and at the same time is stable against MHD interchange modes (owing to the positive curvature of its field lines). Thus the use of complex, non-axisymmetric, fields is not required to insure MHD stability. The disadvantage of the K. T. is that to achieve a positive fusion power balance against the power required to maintain the plugs the central cell must be kilometers in length. One way to reduce the length is to employ the K. T. concept in a cusp-ended geometry. In cusp geometry MHD stability can be maintained at very high beta, thereby reducing the area of the flux bundle that must be plugged at the ring cusps, and, as a consequence, lowering the plug power requirements.

In this paper we will explore the above, and other, K T. variations, with an eye toward still further reducing the size of net-power-producing open-ended fusion systems employing the concept. One attractive possibility is to employ the K. T. plugs solely as MHD "anchors" in a conventional tandem mirror configuration, i.e. one with plug cells and

thermal barriers, but now one that need only employ axially symmetric mirror fields. As shown by theory [5], a modest-pressure plasma, if it occupies an end region characterized by strong favorable field-line curvature, can stabilize a much higher pressure plasma contained in an axially symmetric mirror field, a plasma that would otherwise be unstable against MHD interchange modes. In such an embodiment the power requirements of the K. T. plugs could be substantially reduced, as compared to the case where these plugs must contain the pressure of the central-cell plasma.

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